

# PATENT SPECIFICATION

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NO DRAWINGS



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## (54) DRIED PULSES

(71) We, UNILEVER LIMITED, a company registered under the laws of Great Britain, of Port Sunlight, Birkenhead, Cheshire, England, do hereby declare the invention, for which we pray that a patent may be granted to us, and the method by which it is to be performed, to be particularly described in and by the following statement:—

10 This invention relates to dried pulses such as peas and broad beans.

It is known to introduce a sugar into pulses, for example peas or beans, which are to be dried, and more especially into relatively high maturity pulses. The sugar serves to make the pulses more tender, and to improve their flavour, making them taste more like young, low maturity pulses, which have a high content of naturally occurring sugars. However, difficulty is experienced in introducing sugar into high maturity pulses without also causing undesirable damage, for example skin rupture or separation, or loss of texture, flavour or colour.

25 We have found that an improved product is obtained if the pulses are freeze-dried to remove from 5 to 60% preferably from 25 to 35% of their total moisture content, are treated with an aqueous sugar solution, and finally are dried. This results in a better up-take of sugar, and enables higher maturity pulses than hitherto to be sugared and dried to an acceptable product. The final drying may be accomplished by any suitable means, for example by freeze-drying or air-drying. The invention is particularly applicable to high maturity pulses.

40 The maturity of a pea is usually indicated by its "tenderometer value", which is a measure of the resistance of the tissue of the fresh pea to a crushing force as determined on a Standard Food Machinery and Chemical Corporation tenderometer. For the purpose of this specification a high maturity pea is one having a tenderometer value greater than 110. A tenderometer

value is an average value, found by making measurements on a large number of peas (for example 1,000). High maturity broad beans are those having a sugars content of less than 10% by weight of the total beans solids.

55 The temperature of the sugar solution is not critical; however, if a low temperature is used, up-take may be slow and also bacterial growth may occur in the sugaring solution; if the temperature is high, the peas may be part cooked, giving a product containing on rehydration much damaged material. Further, if a high temperature is employed, the life of the sugar solution is shortened since the sugar caramelises. A temperature in the range 35 to 85°C is suitable, while 55 to 65°C is preferred. The sugar employed may be sucrose, glucose, lactose, or other sugar.

To assist reconstitution for consumption, the pulse skins may be ruptured, i.e. split or pricked, at some stage. This rupture is most advantageously carried out before drying to minimise damage to the pulses.

75 The concentration of the sugar solution, and the time for which the pulses are treated with the solution, have little effect on the up-take of sugar. However, if a very high sugar concentration, for example in excess of 50%, is employed, skin damage in the rehydrated pulses may occur. A sugar concentration of 20 to 40%, preferably about 30%, is preferred, the pulses being dipped preferably for about 5 minutes.

85 Pulses treated according to the process of this invention are reconstituted to a more tender product than those partially air-dried before sugar treatment with the aqueous sugar solution. This appears to be because the sugar stays in the outer layer of the air-dried pulses, while the sugar is more uniformly distributed throughout the freeze-dried pulses.

90 The invention is illustrated in the following Examples. In each case, high maturity

peas were pricked, blanched for 90 seconds in 0.4%  $\text{Na}_2\text{CO}_3$  and 0.7%  $\text{Na}_2\text{SO}_3$  at 100°C, and then blast-frozen.

#### EXAMPLE 1

- 5 Batches of high maturity peas were freeze-dried to remove various proportions of moisture, and then dipped for 5 minutes in a bath

containing 30% sucrose, 2%  $\text{NaCl}$ , 0.2%  $\text{Na}_2\text{SO}_3$ , and 0.04%  $\text{Na}_2\text{CO}_3$  at various temperatures. After sugaring, the peas were air-dried for 16 hours at 50°C. The peas were then cooked for 20 minutes, drained and evaluated by a panel of trained testers for texture and for percentage hard peas. The results are given in Table I.

10

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TABLE I

	(1)	(2)	(3)	(4)	(5)	(6)	(7)
20	31.0	20	43.6	7.4	796	6.2	11
		30	43.8	7.9	735	6.2	16
		40	41.0	8.1	645	6.3	15
		50	41.2	9.1	500	7.0	24
		60	42.4	9.2	785	6.0	14
25	38.8	20	41.2	5.9	690	4.7	15
		30	43.6	5.1	735	6.0	22
		40	40.3	5.7	609	5.7	9
		50	40.5	6.1	673	6.3	14
		60	41.3	5.8	615	6.2	11
30	55.5	20	42.9	4.7	690	6.5	21
		30	43.6	5.7	770	7.0	20
		40	43.7	4.7	753	6.3	14
		50	44.4	5.0	720	6.8	18
		60	46.6	5.5	705	6.3	19

- 35 Column 1 represents the moisture removed in the freeze-drying (expressed as a percentage of the water originally in the peas); column 2 gives the temperature in °C of the sucrose bath; column 3 gives the sugar content of the dried peas (expressed as total weight of sugar  $\times 100$ /weight of solids in the dried peas); column 4 gives the moisture content of the peas after final air-drying (ex-

pressed as a percentage of the water originally in the peas); column 5 gives the  $\text{SO}_2$  content of the dried peas, as p.p.m. The results from the testing panel are given in columns 6 and 7, where column 6 represents texture on a 10 point scale, and column 7 represents the percentage hard peas (bullet-like peas, poorly rehydrated).

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- 50 The texture score used was as follows:

- 10 }  
9 } Peas plump and soft, but not mushy. Texture even, with skins hardly detectable.  
8 }
- 7 }  
6 } Texture slightly uneven or generally firm but not tough. Skins noticeable but  
5 } not objectionable.
- 4 }  
3 } Texture uneven or appreciably mealy. Skins tough.  
2 }
- 60 1 Generally variable, peas mealy or tough, with skins objectionable.
- 0 Unacceptable, e.g. peas excessively soft or mushy, or excessively tough.

The example illustrates the satisfactory sugaring of high maturity peas using a sugar solution having a temperature in the range

20 to 60°C, and having from 30 to 55% of the moisture initially in the peas removed upon freeze-drying.

65

## EXAMPLE 2

High maturity peas were freeze-dried to remove various quantities of moisture, for 5 minutes, and then air-dried at 50°C for 16 hours. The results are given in Table II.

TABLE II					
	(1)	(2)	(3)	(4)	(5)
10	24.5	30	20	8.0	35.0
		40	20	9.7	35.2
		50	20	7.8	36.6
		30	50	8.2	37.6
		40	50	9.4	42.7
15		50	50	9.3	49.4
	33.4	30	20	7.5	35.2
		40	20	8.8	35.7
		50	20	7.5	37.6
		30	50	9.4	34.9
20		40	50	7.8	34.8
		50	50	8.4	35.0
	38.8	30	20	7.3	38.1
		40	20	7.2	39.2
		50	20	7.4	36.5
25		30	50	7.8	35.0
		40	50	7.2	36.2
		50	50	7.2	36.0

Column 1 gives the percentage water removed on freeze-drying (expressed as in Example 1); column 2 gives the sugar concentration of the dip; column 3 gives the temperature in °C of the dip; column 4 gives the percentage moisture in the finally dried product (expressed as in Example 1); and column 5 gives the percentage sugar in the finally dried product (expressed as in Example 1).

The sugar baths used had the compositions:

- 40 30% sugar solution contained 2% NaCl, 0.2% Na<sub>2</sub>SO<sub>3</sub> and 0.04% Na<sub>2</sub>CO<sub>3</sub>,  
 40% sugar solution contained 3% NaCl, 0.2% Na<sub>2</sub>SO<sub>3</sub> and 0.04% Na<sub>2</sub>CO<sub>3</sub>,  
 50% sugar solution contained 3% NaCl, 0.2% Na<sub>2</sub>SO<sub>3</sub> and 0.02% Na<sub>2</sub>CO<sub>3</sub>.

45 This Example illustrates the satisfactory sugaring of high maturity peas using a sugar solution of various concentrations, over a range of sugar solution temperatures and a range of moisture removal on freeze-drying before sugaring.

## EXAMPLE 3

50 Batches of high maturity peas were freeze-dried to remove 33.4% moisture (expressed as in Example 1), and dipped in 30% sucrose solution at 20°C and 50°C for varying times, and then air-dried at 50°C for 16 hours. The results are given in Table III.

TABLE III				
	(1)	(2)	(3)	(4)
55	5	20	8.5	37.8
	10	20	8.8	40.7
	15	20	8.6	41.2
60	20	20	8.7	43.2
	5	50	8.4	40.2
	10	50	8.1	42.2
	15	50	8.4	44.9
	20	50	8.4	45.3

65 Column 1 represents the dip time in minutes; column 2 the dip temperature in °C; column 3 the percentage moisture in the dried peas; and column 4 the percentage sugar (expressed as in Example 1) in the dried peas.

70 This Example illustrates the effect of various times of immersion of the partially freeze-dried peas upon sugar up-take.

## EXAMPLE 4

75 Samples of high maturity peas were prepared by a preliminary freeze-drying to remove approximately 30% moisture (expressed as in Example 1), followed by a sugar dip at 60°C for 5 minutes in 30% sucrose, 0.2% Na<sub>2</sub>SO<sub>3</sub>, 0.04% Na<sub>2</sub>CO<sub>3</sub>, 2% NaCl, and air-dried for 16 hours at 50°C. The peas upon cooking for 15 minutes in gently boiling water gave peas of good flavour and texture, and a uniform bright green colour with no significant breakage or wrinkling.

85 The peas used in the above Examples had a tenderometer value of 110 to 125, and

contained initially 22.5 t 25% naturally occurring sugars.

#### EXAMPLE 5

In this Example, fresh unblanched and unpricked peas were freeze-dried to remove approximately 30% moisture (expressed as in Example 1), followed by a sugar dip at 60° for 5 minutes in 30% sucrose, and air-dried for 16 hours at 50°C. The peas upon cooking for 15 minutes in gently boiling water gave peas of good flavour and texture, and of a uniform green colour with no significant breakage or wrinkling.

#### EXAMPLE 6

A batch of peas having a tenderometer value of 140 were freeze-dried to remove 38.5% of moisture (expressed as in Example 1), followed by a sugar dip at 60°C for 5 minutes in 30% sucrose, and air-dried. The sugar content of these peas after drying was 30.7% sugar on total weight. These peas were cooked, and were rated equally good in texture with similar peas which were treated by dipping the fresh peas in a similar sugar solution for 20 minutes at 95°C. The use of a shorter dip time, in a sugar bath of lower temperature, resulted in much less damage to the peas, and a considerably extended life for the sugar solution.

#### WHAT WE CLAIM IS:—

1. A process for the preparation of dried pulses which comprises the steps of (a) freeze-drying the pulses to remove from 5 to 60% of their moisture content, (b) contacting the partially freeze-dried pulses with an aqueous sugar solution, and (c) subject-

ing the sugared pulses to a further drying treatment.

2. The process according to Claim 1, wherein the sugar content of the pulses after contacting with the aqueous sugar solution is at least 35% by weight of the total solids content of the pulses.

3. The process according to Claim 1 or Claim 2, wherein the drying after contacting with the aqueous sugar solution is an air-drying.

4. The process according to any preceding claim, wherein the sugar solution has a temperature in the range 35 to 85°C.

5. The process according to Claim 4, wherein the sugar solution has a temperature in the range 55 to 65°C.

6. The process according to any preceding claim, wherein the aqueous sugar solution comprises an aqueous solution of sucrose, having a concentration of 20 to 40% by weight.

7. The process according to any preceding claim, wherein the pulses are freeze-dried to remove from 25 to 35% of their moisture content, before contacting with the aqueous sugar solution.

8. The process according to any preceding claim, wherein the pulses are peas.

9. The process of producing dried pulses according to any preceding claim and substantially as described herein with reference to any one of the Examples.

10. Dried pulses produced by the method of any preceding claims.

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